

Analysis of Rawinsonde Spatial Separation for Space Launch Vehicle Applications at the Eastern Range

Space launch vehicles develop day-of-launch steering commands based upon the upper-level atmospheric environments in order to alleviate wind induced structural loading and optimize ascent trajectory. Historically, upper-level wind measurements to support launch operations at the National Aeronautics and Space Administration's (NASA's) Kennedy Space Center co-located on the United States Air Force's Eastern Range (ER) at the Cape Canaveral Air Force Station use high-resolution rawinsondes. One inherent limitation with rawinsondes consists of taking approximately one hour to generate a vertically complete wind profile. Additionally, rawinsonde drift during ascent by the ambient wind environment can result in the balloon being hundreds of kilometers down range, which results in questioning whether the measured winds represent the wind environment the vehicle will experience during ascent. This paper will describe the use of balloon profile databases to statistically assess the drift distance away from the ER launch complexes during rawinsonde ascent as a function of season and discuss an alternative method to measure upper level wind environments in closer proximity to the vehicle trajectory launching from the ER.